

DAY ONE PROJECT

A Federal Strategy for Science Engagement

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The Day One Project offers a platform for ideas that represent a broad range of perspectives across S&T disciplines. This memo was drafted by contributors from the Day One Project, Advancing Research Impact in Society, and LISTEN Network with generous support from the Kavli Foundation in consultation with participants from a Day One Project workshop focused on science engagement. The views and opinions expressed in this proposal do not reflect the views and opinions of the Day One Project S&T Leadership Council and do not represent an official position of ARIS, the LISTEN Network, or the Kavli Foundation.

Summary

The next administration should adopt a federal strategy for science engagement that enables all Americans to learn from, use, and participate in the process and outputs of science.

Investments in science and technology have the greatest impact when paired with increased public access to, and participation in, the scientific enterprise. Emerging areas of basic and applied research, such as synthetic biology and artificial intelligence, have important implications for society. Science engagement is essential for improving public scientific literacy, raising and discussing ethical considerations, and aligning research with public priorities and values. Broadening participation in the scientific enterprise is more than a question of who “does” the science. Rather, it requires looking beyond traditional science, technology, engineering, and mathematics (STEM) education for creative ways to increase public exposure to, understanding of, and meaningful contributions to science.

The first steps in a federal strategy for science engagement should focus on establishing and cultivating federal expertise in science engagement and improving coordination among federal science agencies. These efforts will emphasize knowledge sharing and ultimately allow for a greater understanding of the impact of science engagement on community and scientific outcomes.

Challenge and Opportunity

From the COVID-19 pandemic and climate change to new technologies that will catalyze industries of the future and affect societal health, security, and sustainability, the scientific challenges and opportunities of the coming decades will impact every aspect of society. At the same time, there is societal division around the role of science in decision-making and the persistence of systemic racism and sexism in science. To meet the challenges of today and build a better tomorrow, a robust and inclusive scientific enterprise is needed. Yet the United States’ position as a global scientific leader is in question. Policymakers and scientists are concerned, for instance, that recent growth of research and development (R&D) in China has greatly outpaced growth in the United States.¹ Increased federal investment in research and development is needed to put the United States back on track and in a strong position to achieve its national and international goals. Apparent appetite² for increased investment in R&D, paired with the start of a new presidential term in January 2021, creates an opportunity for a renewed commitment to bolster the U.S. scientific enterprise.

¹ National Science Board (2020). Science & Engineering Indicators. <https://www.ncses.nsf.gov/indicators>.

² Gruber, J.; Johnson, S. (2019). Jump-Starting America: How Breakthrough Science Can Revive Economic Growth and the American Dream. PublicAffairs. Appendix available at <https://www.jump-startingamerica.com/102-places-for-jumpstarting-america>.

The American scientific community has long been valued for its culture of open, curiosity-driven research that consistently seeks to explore new frontiers of knowledge. Any sustained and balanced increase in the nation's investment in R&D for science and technology needs to be paired with a vision for the future of American science that builds on the success of the past. Science engagement must be a cornerstone of a forward-looking R&D strategy. As National Science Foundation (NSF) Director Dr. Sethuraman Panchanathan has observed, "for the U.S. to maintain global leadership through cultivating a robust science and engineering enterprise, accessibility and inclusivity in STEM must be a priority."³

Realizing this priority demands thoughtful consideration of how scientists participate in society and society participates in science. The U.S. scientific enterprise exists for the benefit of all Americans. Federal science agencies have a mandate to serve the public good. Our nation's world-leading universities are guided by a public mission. And most individual researchers have a personal hope that their discoveries will benefit many.

Given the alignment between science and societal welfare, the Federal Government should act to better connect the research that it funds with public priorities and values, and it should act to foster more meaningful exchange among researchers, practitioners, and policymakers, including at local and state levels. Federally-funded research activities can be informed by community priorities and values, and research findings applied as part of the solution to local challenges. Mechanisms for public feedback or participation in the processes of science can be improved. When a diversity of ideas, perspectives, and approaches are heard in the scientific process, fruitful partnerships, transformative discoveries, and novel solutions result.

Yet the United States lacks a cross-cutting federal strategy for science engagement. Science-engagement efforts at federal agencies are disjointed, making it challenging to understand impact, track promising practices, and align complementary activities. Moreover, the goals of public engagement or assessing the societal impacts of research are clearly stated in the mission or authorities provided by Congress for only a subset of agencies. Science-engagement efforts at agencies outside of this subset are frequently limited or nonexistent. Finally, while expertise exists on engaging the public in research and on assessing the ethical, legal, and societal implications of research, this expertise is often overlooked during planning for major research initiatives. Engagement included as an afterthought is often under-resourced and less responsive to public input and participation than engagement activities built-in throughout.

³ National Science Foundation (2020). 75 years on the endless frontier: a vision for the future rooted in the past.

Plan of Action

The next administration should direct the White House Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) to develop and implement a federal strategy on science engagement. This strategy would include three major components, detailed below.

Make science engagement a mandatory part of federal research initiatives.

The next administration should direct federal agencies to include investments in science engagement as part of any proposals for new federal research initiatives. Such investments should be integrated into the budgets allocated for research initiatives. Such investments should also remain distinct from agency investments in STEM education or public affairs.

Launch a federal initiative to boost science engagement.

OSTP should spearhead this initiative, through the following specific actions:

- **Issuing joint guidance from OMB and OSTP outlining authorities** that agencies can use to support and advance public engagement in science.
- **Revitalizing the interagency National Science and Technology Council (NSTC) Subcommittee on Open Science (SOS)⁴** to develop a National Strategic Plan for Science Engagement. The plan should
 - Emphasize ways to integrate ELSI (ethical, legal, and societal impacts) into research similar to the European Union's approach to **responsible research and innovation**.⁵
 - Identify priority opportunities for increased public participation in research, such as in addressing disparate health outcomes, advancing community resilience and adaptation to climate change, or informing the integration of automated technologies into communities and workplaces at national and local levels
 - Include provisions for assessing progress and impact after five years of implementation. Assessment should be done in collaboration with the National Academies of Science, Engineering, and Medicine.
 - Be developed with input from the public and key stakeholders.
- **Establishing a dedicated team of experts to support agencies in developing and executing public-engagement strategies.** This team would be housed at the General Services Administration (GSA). It would be modeled on and collaborate with GSA's Office of Evaluation Sciences (OES).⁶
- **Creating an Assistant Director for Public Engagement position at OSTP.** A primary responsibility of this position would be working with GSA to form a community of practice

⁴ The White House (2016). Charter of the Interagency Working Group on Open Science. National Science and Technology Council. <https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/NSTC/cos-iwgos-charter-1016-signed.pdf>.

⁵ European Commission (2020). Responsible Research & Innovation. <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation>.

⁶ OES is a centralized team that works "alongside agency collaborators to translate behavioral insights into concrete recommendations for how to improve government."

for science engagement for federal personnel who lead research-funding programs and/or who are designing or implementing national research initiatives focused on science and technology. The community of practice would allow personnel to learn from each other about participatory research, effective science-engagement practices and approaches, and steps that departments and agencies can take to broaden public participation and inclusion in science. Participants in the community of practice would be encouraged to share insights with practitioners in the field convened by the OSTP Assistant Director for Public Engagement in Science and the dedicated team of experts at GSA described above; the community of practice should emphasize:

- Sharing knowledge across federal agencies and better linking related science-engagement efforts on topics of national priority, such as health, community resilience, and workforce development.
- Coordinating across national priorities and agencies to better align funding streams and ways of promoting funding opportunities that incorporate science engagement.
- Setting standards for data collection, proposal evaluation, and impact assessments, with a specific emphasis on investigating the impact of supporting engagement on societal and research outcomes.
- Helping the NSTC SOS draft a biannual public report on federal science-engagement activities.

Development and execution of a federal strategy on science engagement would benefit from insights from philanthropies that fund science engagement and civic-engagement experts and institutions, nonprofit science-engagement networks,⁷ community organizations, and the public. Connections between federal efforts and external stakeholders could be bolstered via an inaugural White House “Summit on Public Engagement in Science” that raises the visibility of science-engagement professionals and community successes. The success of these efforts will also depend on support from, and clear communication with, the leadership at the major scientific agencies.

Strengthen and expand NSF’s Broader Impacts (BI) criterion.

Research proposals that are awarded NSF funding must fulfill multiple criteria. NSF’s long-standing “Broader Impacts (BI)” criterion⁸ ensures that funded research has significant societal impacts in addition to intellectual merit. The next administration should build on ongoing efforts

⁷ Including, for instance, the Association of Public and Land-grant Universities (APLU), the Association of American Universities (AAU), the American Geophysical Union (AGU), the American Association for the Advancement of Science (AAAS), and the Association of Science and Technology Centers (ASTC), including the LISTEN Network.

⁸ National Science Foundation (2002). Merit Review Broader Impacts Criterion: Representative Activities. <https://www.nsf.gov/pubs/2002/nsf022/bicexamples.pdf>.

to strengthen the BI criterion and infrastructure^{9,10} and expand it to other scientific agencies during reauthorization. Expanding BI to all federal agencies that award grants for external research grants¹¹ would require substantive infrastructure and support to be effective in practice. Dedicated funding should be added to agency budgets—or a percentage of existing research budgets allocated—for BI activities, such as supporting researchers in achieving and evaluating proposed broader impacts. OSTP can facilitate effective implementation of the BI criterion by documenting and sharing effective, evidenced-based principles and practices for enhancing the societal impact of research.

Where to Start and Precedents to Build On

Federal actions to expand science engagement can build on numerous precedents. These include lessons learned from 20 years of the BI criterion at NSF¹² and 10 years of the America COMPETES Act¹³ as well as promising practices from university engagement efforts such as the Highly Integrative Basic and Responsive (HIBAR) Research Alliance,¹⁴ university-led Grand Challenges,¹⁵ APLU's Public Impact Research,¹⁶ and cooperative extensions.¹⁷

The numerous federally-supported science-engagement activities that already exist can also provide useful models for future work: for example, these activities include dialogue and deliberation work supported by National Oceanic and Atmospheric Administration¹⁸; NIH's engagement, dissemination, and implementation of research with medical patients, grand challenges supported by the Department of Energy, National Institutes of Health, and Department of Defense; and community-centered citizen science at the United States Department of Agriculture and the Environmental Protection Agency.

⁹ National Science Foundation (n.d.). Perspectives on Broader Impacts. NSF 15-008. (See Perspectives of University Participants section). <https://extension2.missouri.edu/media/wysiwyg/Extensiondata/Pro/ARIS/Docs/PerspectivesOnBroaderImpacts.pdf>.

¹⁰ National Science Foundation (2009). Framework for Evaluating Impacts of Broadening Participation Projects. Clewell, B.C.; Fortenberry, N. [Eds]. 33-40. https://www.nsf.gov/od/broadeningparticipation/framework-evaluating-impacts-broadening-participation-projects_1101.pdf.

¹¹ Including but not limited to the Departments of Energy (DOE), Defense (DOD), and Agriculture (USDA), the National Aeronautics and Space Administration (NASA), and the National Institutes of Health (NIH).

¹² National Alliance for Broader Impacts (2018). The Current State of Broader Impacts: Advancing Science and Benefiting Society. <https://extension2.missouri.edu/media/wysiwyg/Extensiondata/Pro/ARIS/Docs/nabi-current-state-of-bi-011118.pdf>.

¹³ "The passage of the COMPETES legislation solidified the use of crowdsourcing in the Federal Government. Growing support for prize competitions helped open the door for the expansion of open innovation in government, such as collaborative ideation, citizen science, bug bounties and hacking-for-good, code-sharing, and other activities in which motivated solvers participate to improve, secure, and enhance missions of Federal agencies." The White House (2019). Implementation of Federal Prize and Citizen Science Authority: Fiscal Years 2017–18. Office of Science and Technology Policy. <https://www.whitehouse.gov/wp-content/uploads/2019/06/Federal-Prize-and-Citizen-Science-Implementation-FY17-18-Report-June-2019.pdf>.

¹⁴ Association of Public & Land-Grant Universities (n.d.). HIBAR.

¹⁵ Popowitz, M.; Dorgelo, C. (2018). University-Led Grand Challenges. UCLA Grand Challenges. Available at <https://escholarship.org/uc/item/46f121cr>.

¹⁶ APLU Public Impact Research.

¹⁷ National Association of State Universities and Land-Grant Colleges (1999). Returning to Our Roots: The Engaged Institution. Kellogg Commission on the Future of State and Land-Grant Universities. <https://www.aplu.org/library/returning-to-our-roots-the-engaged-institution/file>.

¹⁸ For example, the WorldWideViews Program. See <https://ecastnetwork.org/2016/11/15/developing-world-wide-views-on-oceans-and-seas/>.

Finally, a federal push to build capacity for science engagement should inform (and be informed by) other national efforts to advance open science,¹⁹ conduct community-centered and participatory research, incentivize restructuring, actively combat harassment and racism, promote interdisciplinary work with fields such as the public humanities, and build equitable international scientific collaborations. As scientific tools, publications, and data become more transparent and accessible, science engagement will be instrumental in supporting communities interested in using science to achieve their goals. As such, the design of open-science infrastructure and technology should be informed by science-engagement practitioners.

Conclusion

A federal strategy for science engagement would boost the impact of scientific research across society. The COVID-19 pandemic has underscored the importance of the public's understanding of their role in science, as well as the need to strengthen relationships between science and society. A comprehensive federal approach that pairs research and development investments with a federal strategy for science engagement will deliver enormous benefits to citizens nationwide.

¹⁹ National Academies of Sciences, Engineering, and Medicine. Open science by design: Realizing a vision for 21st century research. National Academies Press, 2018.

Frequently Asked Questions

How will a federal strategy on science engagement effectively coordinate agencies with distinct priorities? Why is cross-agency coordination needed—why isn't agency-specific action sufficient?

A federal strategy on science engagement is needed to document and track existing efforts and measure impact. The current lack of coordination and a shared language around science engagement means that practitioners do not have a clear understanding of all relevant work underway, including promising practices and established relationships between communities and scientific institutions. This means that some science-engagement efforts waste time and resources on flawed methodologies and redundant relationship-building.

A federal community of practice will help connect experts at different agencies that are currently siloed. While each agency has distinct priorities, the institutions, practitioners, and researchers that specialize in connecting science and society are not confined to specific scientific disciplines. Moreover, the existing patchwork of federal science-engagement programs means that institutions and practitioners need a higher level of institutional or individual knowledge to identify programs that align with their interests. This limits the diversity of program participants.

How would a federal strategy on science engagement remain nonpartisan, focused on science and not politics?

A federal strategy on science engagement would remain nonpartisan by following the nonpartisan approach to science that every federal scientific agency adheres to. Specifically, the strategy's component steps should be carried out in accordance with existing scientific-integrity policies at federal scientific agencies. Related guidance from OSTP and OMB should reiterate the importance of scientific integrity. The same review processes that prevent political intervention in science should also be applied to federal support of science engagement.

What examples demonstrate the value and urgency of further developing science engagement at federal agencies?

The concurrent crises of the COVID-19 pandemic and climate change best exemplify the urgency for federal action since they are both global issues with local impacts that depend on broader societal contexts. For issues like these, science can play an active role in assessing the problem and identifying potential solutions. But public participation in the scientific process is required at all stages in order for solutions to be feasible in practice and to offer very tangible opportunities for the public to experience the value of science.

This approach is not new. For example, participatory practice is embedded in the structure of the HIV Vaccine Trials network since "a broad range of biomedical HIV prevention and treatment

options is required to meet the diverse needs of individuals and populations.”²⁰ Effective stakeholder engagement enables HIV researchers and clinicians to deliver interventions to the vulnerable populations who most stand to benefit. In addition, the frontiers of basic and translational research continue to explore questions that raise moral and ethical considerations. Regular communication between scientists and other sectors of society help ensure that these considerations remain top-of-mind. The discovery of CRISPR, for instance, transformed the field of genetic engineering. Regulation of genome editing must be informed by a broad array of values. A global citizens’ assembly on genome editing is being convened to provide a “concrete response to the urgent ethical and regulatory questions in relation to genome-editing technologies.”²¹ This deliberative forum builds off of the successes of international citizen’s assemblies on issues such as carbon mitigation.²²

²⁰ Joint United Nations Programme on HIV/AIDS (2011). Good participatory practice: Guidelines for biomedical HIV prevention trials. JC1853E. https://www.hvti.org/content/dam/hvti/Science/ethics/JC1853_GPP_Guidelines_2011_en.pdf.

²¹ Centre for Deliberative Democracy and Global Governance (2019). Global Citizens’ Assembly on Genome Editing. <https://www.globalca.org/about>.

²² Schalit, N. (2020). Why we need a global citizens’ assembly on gene editing. The Conversation, September 17. <https://theconversation.com/why-we-need-a-global-citizens-assembly-on-gene-editing-146398>.

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About the Contributors

The **Advancing Research Impact in Society** is housed at the University of Missouri and works with scientists and engagement practitioners to build capacity, advance scholarship, grow partnerships and provide resources to help them engage with and demonstrate the impact of research in their communities and society.



The **Leaders in Science and Technology Engagement Network, or LISTEN Network**, connects and supports perspectives from across the science-engagement ecosystem, including informal science education, public engagement, journalism and science writing, live events, community science, and science-communication training. LISTEN network participants work to nurture relationships among all people and science, and together envision a world where everyone can participate in, use, learn from, and guide science.



The **Kavli Foundation** is dedicated to advancing science for the benefit of humanity, promoting public understanding of scientific research, and supporting scientists and their work. The foundation's mission is implemented through an international program of research institutes, initiatives and symposia in the fields of astrophysics, nanoscience, neuroscience, and theoretical physics, as well as the Kavli Prize and a program in public engagement with science.



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